

A gauss-newton approach for nonlinear optimal control problem with model-reality differences

ABSTRACT

Output measurement for nonlinear optimal control problems is an interesting issue. Because the structure of the real plant is complex, the output channel could give a significant response corresponding to the real plant. In this paper, a least squares scheme, which is based on the Gauss-Newton algorithm, is proposed. The aim is to approximate the output that is measured from the real plant. In doing so, an appropriate output measurement from the model used is suggested. During the computation procedure, the control trajectory is updated iteratively by using the Gauss-Newton recursion scheme. Consequently, the output residual between the original output and the suggested output is minimized. Here, the linear model-based optimal control model is considered, so as the optimal control law is constructed. By feed backing the updated control trajectory into the dynamic system, the iterative solution of the model used could approximate to the correct optimal solution of the original optimal control problem, in spite of model-reality differences. For illustration, current converted and isothermal reaction reactor problems are studied and the results are demonstrated. In conclusion, the efficiency of the approach proposed is highly presented.

Keyword: Nonlinear optimal control; Gauss-newton approach; Iterative procedure; Output error; Model-reality differences